European Security and Defence Assembly
Assembly of Western European Union

DOCUMENT A/2035 4 June 2009

FIFTY-SIXTH SESSION

Space Situational Awareness

REPORT

submitted on behalf of the Technological and Aerospace Committee
by Edward O'Hara, Rapporteur (United Kingdom, Socialist Group)

DOCUMENT A/2035 4 June 2009

FIFTY-SIXTH SESSION

Space Situational Awareness

REPORT

submitted on behalf of the Technological and Aerospace Committee
by Edward O'Hara, Rapporteur (United Kingdom, Socialist Group)

Report transmitted to: the President of the Council of WEU; the President of the Council of the European Union; the WEU Secretary-General/EU High Representative for the Common Foreign and Security Policy; the President of the European Commission; the EU Commissioner for institutional relations and communication strategy; the Presidents/Speakers and the Chairmen of the Foreign Affairs, Defence and European Affairs Committees of the 39 national parliaments represented in the Assembly; the Presidents of the Parliamentary Assembly of the Council of Europe, the NATO Parliamentary Assembly, the OSCE Parliamentary Assembly, the Baltic Assembly, the Nordic Council, the Parliamentary Assembly of the Black Sea Economic Cooperation, the CIS Parliamentary Assembly; the President of the European Parliament; the Secretaries General of the Parliamentary Assemblies of the Council of Europe, NATO and the OSCE.

Document A/2035 **4 June 2009**

Space Situational Awareness

REPORT[1]

submitted on behalf of the Technological and Aerospace Committee
by Edward O'Hara, Rapporteur (United Kingdom, Socialist Group)

TABLE OF CONTENTS

[1] Adopted by the Committee on 6 May 2009.

RECOMMENDATION 841[2]

on Space Situational Awareness

The Assembly,

(i) Recalling that the European Union, in cooperation with the European Space Agency (ESA), makes a key contribution to creating space-based public services, notably the Galileo global positioning system and the GMES (Global Monitoring for Environment and Security) programme;

(ii) Stressing that ESA has asserted its role as a world player and reliable partner in international cooperation and that national programmes increasingly are being designed to complement ESA's activities in order to better serve the interests of Europe as a whole;

(iii) Noting that these programmes are tangible proof of the EU's determination to be a major player in space and to assert its autonomy and above all demonstrate outstanding knowledge and expertise in that sector;

(iv) Welcoming the ESA Council decision of November 2008 to set up a preparatory programme as part of the Space Situational Awareness (SSA) project;

(v) Noting that according to ESA the aim of the SSA initiative is to make a contribution to protecting European space systems, in particular those linked with operational services, whose availability will be guaranteed by the programme through the rapid provision of reliable information on the space environment, threats and for the sustainable use of outer space;

(vi) Stressing that Space Situational Awareness (SSA) is defined as a comprehensive knowledge of the population of space objects, of the space environment, and of the existing risks and threats;

(vii) Noting that the SSA programme and the space sector as a whole are a fundamental component of the European Security and Defence Policy and that space security is essential for European security in general;

(viii) Recalling that the United States, by far the leader in this field, currently disseminates the orbital parameters and identities of most orbiting satellites, providing Europe with access to a wealth of information;

(ix) Considering nevertheless that notwithstanding the seemingly comprehensive nature and exactitude of American data, Europe should not relinquish its sovereignty in this strategic sector;

(x) Stressing that the SSA programme will enable Europe to promote international cooperation and negotiate with other space actors on an equal footing, while supporting the peaceful use of outer space through the independent monitoring of compliance with the relevant treaties and agreements;

(xi) Noting that the SSA programme should contribute to the protection of European space systems, in particular those relevant for operational services, offer defence applications involving the use of dual-use systems, and that finally it will further the overall economic outlook for the use of space and thereby serve the EU's Lisbon objectives;

(xii) Considering that Europe's dependence on space-based assets – likely to become more marked in the short term – is worrying, because any shutdown of even a part of the space infrastructure could have significant consequences for citizens' safety and for economic activities and would also considerably hamper the organisation of emergency services;

(xiii) Stressing that should Europe finally decide to establish such an SSA capability, it should do so in dialogue and cooperation with its allies and partners, in particular the United States,

[2] Adopted by the Assembly on 4 June 2009 at the 4th sitting.

RECOMMENDS THAT THE COUNCIL INVITE THE WEU NATIONS AS MEMBERS OF THE EUROPEAN UNION TO

1. Ensure that once a consensus on governance and data policy has been reached within the Space Situational Awareness (SSA) Preparatory Programme there is full dialogue and cooperation with the United States;

2. Examine the numerous existing examples of cooperation – in particular between the EU and NATO or between Europe and the US Air Force – that could serve as a model for organising effective and mutually beneficial cooperation, for which there is no precedent in the space sector;

3. Guarantee that such cooperation starts during the three-year SSA Preparatory Programme with a view to having a firm project at the end of that period;

4. Avoid all duplication of equipment and of its use in the technical systems, which will remain entirely separate, along the lines of what is done for meteorological satellites, where the two sides have agreed to cover complementary zones;

5. Ensure that the eminently political issue of agreeing which data may be disseminated and which may not is settled before launching any cooperation process;

6. Guarantee that existing national and ESA capabilities are made available to the programme;

7. Take on board the recommendations of the French space agency CNES concerning the elements that the ideal European SSA programme should contain;

8. Encourage cooperation between France and Germany on the GRAVES and TIRA sensors, which are fundamental components of the European programme.

EXPLANATORY MEMORANDUM

submitted by Edward O'Hara, Rapporteur (United Kingdom, Socialist Group)

I. Introduction

1. Over the years the space sector has flourished. As underlined by Rebecca E. Johnson, "Space is a key element for key EU policies including transport, agriculture, environment, security and information society, integrated with terrestrial components in monitoring and communications networks and services".[3] That environment must therefore be protected.

2. The European Union, working alongside the European Space Agency (ESA) and the member states, is making a key contribution to confirming Europe's status as a space power through the creation and co-funding of space-based public services such as the Galileo global positioning system, and through its coordinating role in the GMES programme.[4]

3. ESA has asserted its role as a world player and reliable partner in the field of international cooperation. National programmes increasingly are being designed to complement ESA's activities in order to better serve the interests of Europe as a whole.

4. Finally, it must be remembered that the European Union has numerous projects on the go. The first and second phases of the GMES space segment programme are being conducted in parallel. The Meteosat Third Generation (MTG) Development Programme and the European GNSS (Global Navigation Satellite System) Evolution Programme are scheduled to start in 2009.

5. These programmes are tangible proof of the EU's determination to be a major player in space, one that is autonomous and recognised for its in-depth knowledge and expertise in that sector.

6. The concerns about the fact that the EU does not possess the capability to monitor space and its assets and to identify potential man-made or natural threats to its security have been formally recorded in the conclusions of the workshop on security and arms control in space and the role of the EU held on 21-22 June 2007 in Berlin.[5]

7. French President Nicolas Sarkozy, speaking at Kourou (European Space Centre) on 11 February 2008, stressed the need to give Europe an autonomous spacewatch capability as proposed by ESA and for that purpose to develop a space situational awareness programme in order to meet the imperative of strengthening the security of space activities. Action, he said, should be founded on three principles:

- free access to space for peaceful purposes;
- preserving the security and integrity of satellites in orbit;
- respect of states' legitimate right to self-defence.

8. As a leader in the European space sector France's views merit serious attention.

9. It is in that spirit that at the last ESA Ministerial Council on 25 and 26 November 2008, Europe took a new step forward when the Ministers voted in favour of setting up a preparatory programme as part of the Space Situational Awareness (SSA) project. Up until then the United States had been the only country to possess the requisite space surveillance and data processing systems.

10. According to the European Space Agency, the aim of the SSA initiative is to make a contribution to protecting European space systems, in particular those linked with operational services. The programme will guarantee the availability of those services by rapidly providing reliable information on the space environment, threats and for the sustainable use of outer space.

[3] Europe's Space Policies and their Relevance to ESDP, Rebecca E. Johnson, European Parliament, Brussels, June 2006.
[4] Global Monitoring for Environment and Security.
[5] ESA Council, report on the Space Situational Awareness Preparatory Programme Proposal.

11. Space Situational Awareness (SSA) is defined as a comprehensive knowledge, understanding and maintained awareness of the population of space objects, of the space environment, and of the existing threats/risks.[6]

12. The SSA programme and the space sector as a whole are an essential component of the European Security and Defence Policy (ESDP). European space security is essential for European security in general.

13. This report does not claim to have all the answers or to offer an exhaustive technical assessment of the SSA programme. Rather its role is to indicate a number of avenues for reflection on the part of the EU and its member states.

14. In order to address all aspects of this programme we need first to look at the American experience. Indeed, the notion of space situational awareness was born in the United States. We will then consider the European dimension of the programme and its mode of operation. Finally we will explore various avenues for the further development of this programme. As we will see, a number of areas remain to be defined.

II. The United States, a key player in the field of SSA

1. Origins of the notion of Space Situational Awareness

15. The notion of "situational awareness" dates back to the 1970s. The term was used for the first time by the US Air Force during the Vietnam War when it was realised that combat pilots' ignorance of what was going on in their immediate environment, in the action zone, often had fatal consequences: their aircraft were being attacked and destroyed before they had even realised that an enemy aircraft was close. This strengthened the United States' conviction that it was vital to understand the situation on the ground in order to be able to deal with it effectively.

16. Situational awareness can be defined in general terms as the perception of factors in a specific environment and precise timeframe. Those factors need to be interpreted in order to assign them a status and precise function allowing them to be identified quickly.

17. That theory quite naturally also applies to space. The term "space situational awareness" (SSA) was used for the first time in 2001 by Donald H. Rumsfeld in his report on space.[7]

18. At the level of the European institutions the notion of space situational awareness covers a range of actions that provide an overview of the space environment as well as the requisite response capability.

2. The United States SSA programme

19. The United States, well ahead of Europe in this field, perceives space as a new area of confrontation.

20. The American space control programme is based in strategic terms on three key objectives: space situational awareness (SSA), the defence of American civil and military satellites and finally, the activation of space weapons. Your Rapporteur will examine the importance attached to setting up the SSA programme.

21. The United States Space Surveillance Network is part of the United States Strategic Command's (USSTRATCOM) mission and involves: "detecting, tracking, cataloguing and identifying man-made objects orbiting Earth, active/inactive satellites, spent rocket bodies, or fragmentation debris. Space surveillance accomplishes the following:

- Analyze new space launches and evaluate orbital insertion;
- Detect new man-made objects in space;

[6] Space Situational Awareness Preparatory Programme Proposal, European Space Agency Ministerial Council, 10 November 2008.

[7] Report of the Commission to Assess US National Security Space Management and Organization, pursuant to Public Law 106-65, 11 January 2001, Executive Summary, p. 16.

– Chart present position of space objects and plot their anticipated orbital paths;

– Produce and maintain current orbital data of man-made space objects in a space catalogue;

– Inform NASA and other government entities if objects may interfere with the orbits of the Space Shuttle, the International Space Station, and operational satellite platforms;

– Predict when and where a decaying space object will re-enter the Earth's atmosphere;

– Prevent a returning space object, which to radar looks like a missile, from triggering a false alarm in missile-attack warning sensors of the US and other countries ;

– Determine which country owns a re-entering space object;

– Predict surface impacts of re-entering objects and notify the Federal Emergency Management Agency and Public Safety Canada if an object may make landfall in North America or Hawaii".[8]

22. USSTRATCOM's space control mission includes: surveillance of space, protection of US and friendly space systems, prevention of an adversary's ability to use space systems and services for purposes hostile to US national security interests and direct support for battle management, command, control, communications, and intelligence. The space control mission is conducted by USSTRATCOM's Joint Functional Component Command for Space (JFCC-SPACE).

23. JFCC-SPACE, through its Joint Space Operations Center (JSpOC), detects, tracks and identifies all man-made objects in earth orbit. Teams work around the clock keeping constant track of these objects. They task the Space Surveillance Network (SSN), a worldwide network of 29 space surveillance sensors (radar and optical telescopes, both military and civilian), with observing the objects. The teams use computers to match sensor observations with the more than 17 000 man-made orbiting objects and update the position of each one. These updates form the "Space Catalog", a comprehensive listing of the numbers, types, and orbits of man-made objects in space.

3. The making available of US data to the European Union

24. The United States, by far the leader in this field, disseminates free of charge, through the internet, the orbital parameters and identities of most orbiting satellites. The information is provided by the US Space Command in charge of managing the Space Surveillance Network (SSN). The disseminated data are regularly updated, at least once a day for satellites in low earth orbit (a little over 9 000 objects).

25. The resulting catalogue is used operationally to monitor collision risks between satellites and debris. It should be noted that the survey radar can track debris down to 10 cm, but with low or medium accuracy as regards the orbital parameters. This does not generally allow an avoidance manoeuvre to be decided with a sufficient degree of confidence.

26. Currently this programme provides Europe with a wealth of information. Yet that information is still not sufficient for a perfect apprehension and control of the space environment.

27. It is therefore important, notwithstanding the comprehensive and precise nature of those data, that Europe should not relinquish its sovereignty in this sector or delegate such a key strategic task to others.

28. Russia and China also possess optical radar and telescopes but unlike the United States do not share the information. Currently the most extensive assets in this area remain by far those deployed by the Americans.

[8] USSTRATCOM Space Control and Space Surveillance Fact Sheet (28 February 2008). Official website of the United States Strategic Command. http://www.stratcom.mil/

III. The characteristics of a European Space Situational Awareness (SSA) Programme

1. The advantages of a European SSA programme

29. What does Europe stand to gain from having its own SSA system? The answer is that SSA is recognised as an essential prerequisite for the autonomous and safe conduct of space activities.[9]

30. According to the conclusions of a workshop that was held to discuss the security and control of weapons in space and the role of the EU, "(...) the establishment of an independent space situational awareness is a key requirement (…)".[10]

31. This new SSA programme will reduce Europe's heavy dependence on the United States and allow it to obtain by direct means the information it needs to protect its space systems against orbital debris and adverse space weather.

32. A European SSA capability will contribute to the protection of European space systems, in particular those that are relevant for operational services. Since it also has military applications, it will involve the use of dual-use systems. An SSA system will further the overall economic outlook for the use of space and thereby serve the EU's Lisbon objectives.

33. Moreover, the programme will enable Europe to promote international cooperation and to negotiate on an equal footing with other space actors and will also facilitate the peaceful use of outer space through the independent monitoring of compliance with the relevant treaties and agreements. Last but not least, a European SSA system is a precondition for a comprehensive space traffic management system. [11]

34. SSA serves the implementation of the strategic missions of the European Space Policy based on the peaceful uses of outer space by all the states, by supporting the autonomous capacity to securely and safely operate the critical European space infrastructure.

35. Space-based systems have become indispensable enablers for a wide spectrum of applications critical to key areas of the economy, including those related to security. Our dependence on space-based assets is likely to become more marked in the short term.

36. That dependence is worrying, however, because any shutdown of even a part of the space infrastructure could have significant consequences for citizens' safety and for economic activities and would also considerably hamper the organisation of emergency services.

37. Accurate, timely and complete space situational awareness is instrumental for protecting critical European infrastructure in space and for the secure and safe operation of its space activities and services as well as for the protection of the population in case of re-entry events or possible near-earth object (NEO) impact threats. The capacity to assess the situation in space also enables liability assumptions to be established.

38. The development of an autonomous SSA capability will also enable Europe to play a fundamental role in support of the peaceful uses of outer space by providing the international community with independent options for verifying compliance with international treaties and codes of conduct[12] on disarmament and non-proliferation of weapons in space. Indeed space "weaponisation" could become a reality: the proliferation of space weapons constitutes a real risk that could one day lead to space becoming a more hostile environment than ever.

[9] Space Situational Awareness (SSA) for Europe – A First Important Step, ESPI Perspectives 16, Wolfgang Rathgeber, Research Fellow at the European Space Policy Institute (ESPI).
[10] Extract from the conclusion of the Workshop on security and arms control in space and the role of the EU, 21-22 June 2007, Berlin.
[11] Rathgeber, Space Situational Awareness.
[12] Portugal, the then holder of the EU Presidency, on 18 September 2007 proposed a code of conduct on space objects and space activities.

2. How the European SSA programme will work

39. The European SSA programme will be composed of a core element covering governance, data policy, data security, the space architecture and space surveillance. It will include three additional elements: space weather and near-earth objects (NEO) surveillance; bread-boarding of radar components and pilot data centres. It will cover four essential functions:

- space surveillance,
- space imaging,
- space weather,
- near-earth objects surveillance.

The last two areas are a French speciality; they do not figure in the American SSA programme.

40. The different functions fall into three main categories:

- **Space surveillance** in order to obtain information about space debris and all space objects. This part refers to the detection and/or tracking of man-made objects and the identification (and characterisation) of detected objects, as well as the determination and prediction of orbital status, co-variance information, spacecraft manoeuvres, spacecraft attitude, and antenna/instrument pointing.[13] Indeed, it has become indispensable to know not only the positions of all orbiting objects, but also their nature and purpose;
- **Detection of possible threats** and anticipation of the consequences for space activities generally. This involves predicting and assessing the risk posed by re-entries to humans and property on the ground and in airspace; detecting and assessing adversary use (or preparations for such use) of space systems; detecting in-orbit explosions; predicting and/or detecting in-orbit collisions and permanent or temporary disruptions of mission and/or service capabilities; and predicting and detecting the potential impact of a near-earth object.[14]
- **Understanding the space meteorological environment:** monitoring and predicting the effects of radiation, ionospheric perturbations and geomagnetic anomalies. The space environment part refers to the detection and/or tracking of natural objects, the detection and understanding of interferences and man-made environments, the detection and forecasting of space weather and its effects, as well as the understanding and prediction of the natural meteoroid environment and its effects.[15]

41. This programme must fulfil the following functions: monitoring space and satellites, assessing the main capabilities and supplying relevant data to decision-makers.

IV. Preparatory Programme

42. On 25 and 26 November 2008, the space ministers of the ESA member states, meeting in The Hague, took a number of decisions with regard to European space policy. A key point on the agenda was a proposal for a space situational awareness system and in particular the decision to launch a preparatory programme, for which a complete five-year programme with a budget envelope of 100 million euros was then submitted. In view of the current economic climate the programme budget was revised downwards, but not its objectives. The result was therefore a rescheduling, as opposed to a rejection, of the programme. The preparatory programme, now set to run for three years, has a budget of 55 million euros.

43. The overall aim of the Space Situational Awareness (SSA) Preparatory Programme is to support European independent use of and access to space for research or services, by providing timely and quality data.

[13] ESA Council, report on the Space Situational Awareness Preparatory Programme Proposal.
[14] Ibid.
[15] Ibid.

44. The preparatory programme will consist of four elements. The first will be dedicated to governance, data security and data policy, SSA architecture and the space surveillance aspects needed to ensure the coherence of the overall SSA system. The second element will be devoted to space weather activities and near-earth objects. The third element will cover the bread-boarding of essential surveillance radar components based on available technology, and the fourth the prototyping of pilot data centres.

45. This first phase marks an important step in providing political backing to the SSA programme. It will involve:

– the elaboration of an SSA governance model and the related data policy;

– the consolidation of SSA requirements and an architectural study.

– radar bread-boarding and pilot data centres.

– initiation of the delivery of agreed precursor services in the areas of Space Surveillance, Space Weather and NEO.

46. According to the abovementioned ESPI study, "The political concerns include the attitude that issues like governance, data policy, ownership, operation and financing should be clarified for good before the system's architectural set-up is designed and the actual hardware is procured and deployed. The SSA preparatory programme for the next three years mainly foresees studies and paperwork, with some initial hardware procurements. The core element will comprise the issues of governance, data policy, architecture and space surveillance".[16] This SSA preparatory programme, then, consists largely of studies and workshops with the member states.

47. The SSA activities will be broken down into four distinct elements:

– core element;

– space weather element, including NEOs;

– radar element;

– pilot data centres element.

48. In order to deal with the issue of governance, ESA together with the European institutions and participating states will support the following activities:

– interaction with institutional stakeholders through dedicated workshops aimed at collecting the views of the participating states and discussing the governance options identified as the most promising;

– consultations with the user community through meetings of user representative groups[17] in order to identify the operational concerns arising out of the data policy;

– international workshops bringing together the relevant European and/or national authorities in order to exchange information and support cooperation with the other partners (such as international organisations or the United States) on issues like data policy, data security and governance;

– studies and analyses, with the support of think-thanks, academia and legal advisors, in order to provide an overview and detailed analysis of relevant existing governance and data policy models in the space domain and beyond. These studies will also consider the legal and financial implications of the potential exploitation of the overall system by multiple public and private entities, both civilian and military;

49. During the preparatory programme, the following specific activities will be undertaken:[18]

[16] Rathgeber, Space Situational Awareness.
[17] The SSA User Representatives Group, representing potential user communities, was set up by the Agency at the end of 2006.
[18] ESA Council, report on the Space Situational Awareness Preparatory Programme Proposal.

- consultations with relevant EU institutions and ESA member states to support the development of an appropriate governance model for the future European SSA system;
- development of SSA data security and data policy, including associated agreements with data providers in the areas of surveillance and tracking, space weather and NEOs;
- study and design of the overall European SSA system architecture, taking into account international cooperation;
- consolidation of requirements related to the data centres, including the functional requirements of the pilot data centres;
- establishment of a consolidated list of SSA services;
- architectural design of all the data centres;
- establishment of a consolidated list of standards for all the services related to the SSA system;
- coordination and fostering of cooperation with international partners;
- establishment of service-level agreements for the procurement of services from the relevant national and/or international assets;
- evaluation of possible transfers of national assets to the European SSA system in the form of in-kind contributions.

V. The challenges facing a European SSA programme

1. The challenge in terms of governance

50. After a two-year period, which will take us up to 2010, the ESA Council will take a decision on the project's viability and future. The ministers will base their opinion on a report on the project's governance, for it is here, and not with the technical components, that the real difficulties lie. The major challenge facing the project remains all aspects pertaining to governance, data policy and security, the space architecture and space surveillance.

51. With regard to the governance model, the SSA stakeholders are to agree on the most "appropriate institutional, technical and financial framework able to support decision-making, the rules for decision-making and, in addition, the mechanisms to ensure conformance with the data policy rules and procedures".[19]

52. Concerning data policy and data security, the stakeholders will have to agree on "the rules and procedures for accessing, handling, storing and distributing on the one hand raw data gained by sensors and on the other hand processed data processed at subsequent system stages".[20]

53. The governance, data policy and data security models to be put in place for the exploitation of the elements of the European SSA system must:

- respect data classification requirements (security/confidentiality, classified/proprietary) during access to and distribution of the data;
- consider legal and other aspects linked with international cooperation with non-European partner countries or international organisations;
- make provision for multilateral cooperation between national and European data centres;
- take into account the requirements of commercial service providers;
- make provision for the mixed use of assets and data fusion, combining space-based and ground-based assets as well as survey, tracking and imaging sensors;
- allow for the future evolution of the system;

[19] Ibid.
[20] Ibid.

54. Three types of activities will be undertaken for that purpose:[21]

- collaboration with the participating states and the relevant EU institutions in order to define an appropriate model of governance for the future European SSA system.
- drawing up of data security requirements and data policy for the distribution of SSA data, taking into account confidentiality requirements and international political considerations;
- architectural design of the complete SSA system, as well as specifications for and the architectural design of the new data centres, taking into account the data policy developed for the distribution of SSA data. These data centres will be responsible for the acquisition, processing, dissemination and possibly fusion of data, as well as for the associated delivery of services.

2. The challenge of EU-US cooperation

55. "While an independent surveillance capability is needed, it should not be established in isolation from our partners. Dialogue and coordination, in particular with USA, remains important (…)".[22]

56. Given that SSA-related information in areas such as space surveillance, space weather and NEOs is to a large extent made available to Europe by American organisations (US Air Force, NASA, etc.), good cooperation with the US authorities and mutual trust are vital for the successful implementation of an SSA capability in Europe.[23]

57. "Today, Europe is dependent on the goodwill of non-European space powers to receive essential information on what is happening above our heads. For example, databases of satellite orbits and debris objects are not fully disclosed to us due to sensitivity of the information; sometimes the information we receive is insufficiently accurate."[24]

58. Cooperation is one of the major challenges we face in the years to come. For that, however, there are two major prerequisites. On the European side, first of all, a swift consensus must be reached on governance and data policy in the framework of the European preparatory programme. Secondly, certain American installations that have been in use for many years – in some cases as long as 40 years – need to be modernised. Once those two conditions are met the discussions can start.

59. According to Richard W. McKinney,[25] such cooperation would benefit the United States as much as Europe. However, its various components need to be defined.

60. It should be noted that there is currently no precedent for cooperation on such a scale in the space sector. There are, however, examples of cooperation in other areas – for example between the EU and NATO, or between Europe and the US Air Force – which could perhaps serve as a model or at least give some guidance for organising effective cooperation in this sector.

61. It would be useful for those discussions to start during the preparatory programme. It is estimated that Europe should have made considerable headway on the governance issue after a year or so's reflection, at which time it could then open discussions with the United States. If the negotiations are incorporated into the preparatory phase it should be possible to come up with a finalised project at the end of the three-year period. In this way cooperation with the United States would become a genuine component of the European programme. The question is how much importance Europe wishes to attach to cooperation with the American programme.

62. There have already been joint European-US workshops on the technical aspects of the project: the real challenge is a political one. Regarding the technical aspects it is important to avoid duplication

[21] Ibid.
[22] Extract from the conclusion of the workshop on security and arms control in space and the role of the EU, 21-22 June 2007, Berlin.
[23] ESA Council, report on the Space Situational Awareness Preparatory Programme Proposal.
[24] Extracts from an interview with Nicolas Bobrinsky, in charge of the SSA Preparatory Programme Proposal, 11/13/08. http://www.esa.int/
[25] European Space Liaison, Office of the Under Secretary of the US Air Force, Member, Senior Executive Service.

of equipment and its use. This is what is done for meteorological satellites, for example, which the two sides have agreed should cover complementary rather than identical zones. The technical systems will, however, remain entirely separate.

63. Cooperation will cover the organisational aspects of data exchanges. Indeed, it is important to cross-check information in order to avoid errors of the kind that led, for example, to the collision on 10 February 2009 between the Russian Cosmos satellite (no longer in service) and the United States Iridium satellite, causing the accidental destruction of the latter. While there is no such thing as a zero risk, better cooperation might well have enabled that particular incident to be avoided.

64. The delicate aspect of cooperation is agreeing which data may be disseminated and which may not. This is an eminently political issue which must be settled before putting the cooperation procedures in place.

3. A technical challenge

65. According to Patrice Brudieu, who is in charge of the space situational awareness programme at CNES[26], the ideal European SSA programme should contain the following elements:

- at least one (ideally two) survey radar derived from GRAVES, for objects down to 10 cm in size;
- a tracking radar (like the Armor), available 24 hours a day with a short notice time;
- optical means for MEO (Medium Earth Orbit) and GEO (Geostationary Orbit);
- a data and computation centre with an approved data security and data policy (EU level policies);
- possibly: radar and/or optical imagery means, and detection and observation satellites;
- various means for NEO detection, space weather monitoring, etc.;
- a network making the best use of national or ESA available sensors.

66. "A space situational awareness system is a strategic key asset (which can be developed making use of existing capabilities, in particular at the level of individual EU member states)".[27] This statement is a crucial reminder that the SSA programme is not starting out from scratch, from the technical standpoint.

67. In that regard, Franco-German cooperation is very promising, because the two countries have sensors (GRAVES and TIRA) that are complementary and they have demonstrated in the past their capacity together to be a driving force for European integration. Can we imagine those two sensors forming the basis for the European project? It is at least feasible to imagine that they could be the contributors at national level to this project.

68. The means currently available in Europe for tracking and identifying objects in low earth orbit (LEO) are the German imaging radar TIRA and the French ARMOR tracking radar. A tracking radar can detect and track centimetre-size objects if there is a pre-designation by the survey radar catalogue, and they provide quite good accuracy regarding orbital parameters. But the key point here is that to be efficient, a tracking operation must be performed within hours after a collision warning is triggered. A tracking radar must be available 24 hours around the clock, which is not the case of the two abovementioned European radars.

69. Many telescopes exist in Europe for tracking and identifying objects in geostationary orbit (GEO).[28] Details of the characteristics of the different radar systems may be found in the appendices to this report.

[26] Centre National des Etudes Spatiale.
[27] Extract from the conclusions of the Workshop on security and arms control in space and the role of the EU, 21-22 June 2007, Berlin.
[28] Cf. Appendix I.

VI. Conclusions

70. According to the report of the ESA Council, "a well funded and strongly implemented SSA can serve the ambitious goals of Europe to become one of the most dynamic knowledge-based societies in the world, thus providing a favourable platform for Europe's institutions, organisations, industry and scientists to maintain a leading edge in preserving the sustainable and peaceful exploitation of outer space while reinforcing global safety and security".[29]

71. The SSA programme is therefore recognised by the European Union as being necessary and useful: necessary in the sense that Europe must reduce its dependence on the United States, which is currently the only country with an official space surveillance programme prepared to share information with others, and useful, given the growing importance of space and the need for Europe to be able to guarantee its own security.

72. For three years the different workshops will address a whole host of questions. The system of governance, which is the core of the programme, must be clearly defined. It would be logical, before tackling the technical issues, to define the conditions for use of the future database. The issue of cooperation with the United States must also be addressed. While Europe does not wish to depend totally on the United States, it is desirable and indeed essential to maintain a strong link in order to ensure better quality information.

[29] ESA Council, report on the Space Situational Awareness Preparatory Programme Proposal.

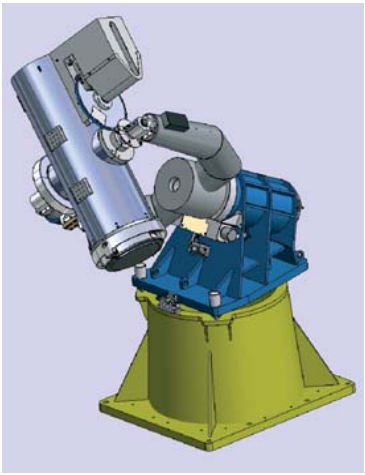
APPENDIX I

Existing Optical Sensors[30]

Tenerife
ESA operates a space debris telescope on Tenerife that covers a sector of 120° of the GEO ring. From single observations, initial orbits can be derived which are generally adequate for re-acquisition of the object within the same night, and which can then be successively improved.

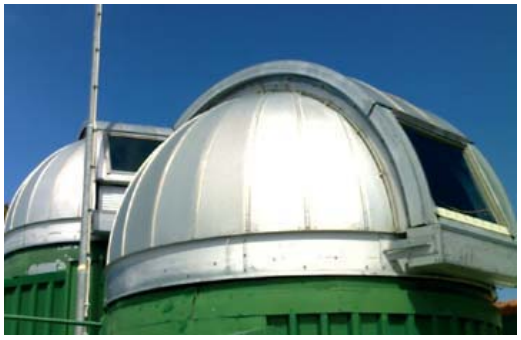
The ESA Space Debris Telescope at Tenerife, Spain

TAROT
CNES uses observation time of the TAROT telescope (Télescope à Action Rapide pour les Objets Transitoires) to survey the GEO ring. TAROT's primary mission is to detect the optical afterglow of gamma-ray bursts. A companion telescope, TAROT-S, has been deployed in Chile.



The TAROT telescope of CNRS at Calern/France and in Chile (CNRS)

Starbrook
The British National Space Centre (BNSC) has sponsored the Starbrook wide-field telescope as an experimental survey sensor since 2006. The telescope is located at Troodos, Cyprus. It can detect GEO objects down to 1.5 m in size (visual magnitude of +14).



The Starbrook telescope of BNSC at Cyprus (SpaceInsight) (SpaceInsight)

ZIMLAT/ZimSMART
The Astronomical Institute of the University of Bern (AIUB) operates a ZIMLAT telescope. From its location in Zimmerwald, the telescope covers a sector of 100° of the GEO ring. The primary applications of ZIMLAT are astrometry and laser ranging. However, up to 40% of its night-time observations are used for follow-ups of GEO objects discovered by the ESA telescope. ZIMLAT was complemented in 2006 by the 20 cm ZimSMART telescope (Zimmerwald Small Aperture Robotic Telescope).

The ZIMLAT telescope at Zimmerwald, Switzerland (AIUB)

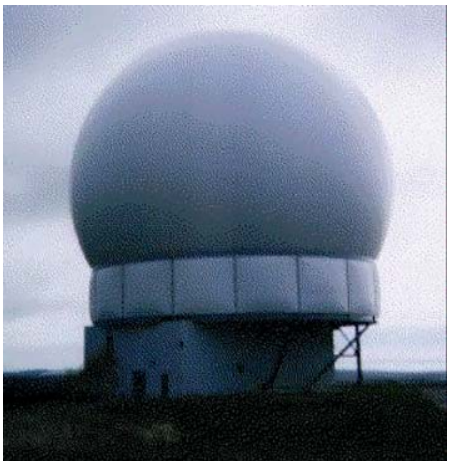
[30] "Europe's Eyes on the Skies". The proposal for a European Space Surveillance System. ESA Bulletin 133 – February 2008.

APPENDIX II

Existing Radar Sensors in Europe[31]

Fylingdales
The most powerful space surveillance sensor in Europe is located in Fylingdales (UK) and is operated by the British armed forces. Most of the activities are geared to the US Space Surveillance Network (SSN) early warning and space surveillance mission.

Globus II
A second facility associated with the US SSN is the Norwegian Globus II radar. It is located in Vardø, at the northernmost tip of Norway. Due to special bilateral agreements between the US SSN and the operators of Fylingdales and Globus II, data from these sites have so far not been available for unclassified use within Europe.



The Globus II X-band radar of the NIS at Vardø, Norway (NIS)

Chilbolton
The Chilbolton radar is located in Winchester, UK, operated by the Rutherford Appleton Laboratory (RAL). It is mainly used for atmospheric and ionospheric research. With a planned upgrade the radar will be able to track LEO objects down to 10 cm sizes at 600 km altitude.

The Chilbolton S-band radar of RAL at Chilbolton, UK (RAL)

GRAVES
The French GRAVES system (Grand Réseau Adapté à la Veille Spatiale) is presently the only European installation outside the US SSN that can perform space surveillance in the classical sense. GRAVES is owned by the French Ministry of Defence and operated by the French air force. The system produces a “self-starting” catalogue which can be autonomously built up and maintained. It is limited to objects of typically 1 m size and larger in low earth orbits (LEO), with a total count of about 2 200. Routine operations started in 2005.

[31] Ibid.

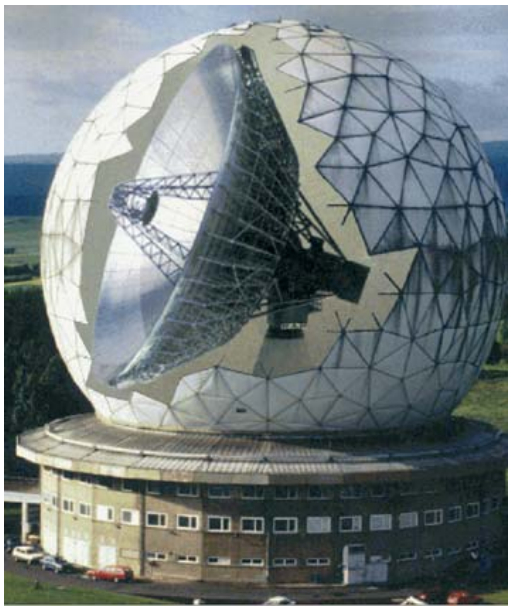
FS Monge

DGA/DCE, the Systems Evaluation and Test Directorate of the French Ministry of Defence, is operating several radar and optical sensors throughout France. The most powerful of these systems, Armor, is located on the tracking ship Monge. The two radars are dedicated to tracking tasks, based on high resolution angular and range data.

The Armor C-band radars on the French naval vessel Monge (DGA)

TIRA

The German FGAN Radar belongs to the Research Establishment for Applied science at Wachtberg. In its tracking mode, the TIRA system determines orbits from direction angles, range, and Doppler for single targets. The detection size threshold is about 2 cm at 1000 km range. For statistical observations this sensitivity can be enhanced to about 1 cm, when operating TIRA and the nearby Effelsberg 100 m radio telescope in a bistatic beam-park mode with TIRA as transmitter and Effelsberg as receiver.



The TIRA L and Ku-band radar of FGAN at Wachtberg, Germany (FGAN)

EISCAT

EISCAT is a network of European Incoherent Scatter Radars, with sites in Norway, Sweden, Finland and Svalbard. The EISCAT system is mainly used for high-latitude ionospheric research. Its radar echoes, however, also contain information on LEO space objects. The Tromsø transmitter/receiver site is able to detect objects down to 2 cm sizes at altitudes of 500 to 1 500 km. Since these measurements are insufficient to determine complete orbits, EISCAT is only of limited value for space surveillance.

ACKNOWLEDGEMENTS

Your Rapporteur would like to thank the following people, without whose valuable assistance he could not have drafted this report:

Luca Del Monte, Security Strategy and Partnership Development Office, Director General's Policy Office, European Space Agency

General Bernard Molard, Vice-President Defence and Security, EADS Astrium

Colonel Garcia Brotons, Deputy Head of the Space and Joint Services Office of the French Defence Staff.

Richard W. McKinney, US Air Force, European Space Liaison, Office of the Under-Secretary of the Air Force, Member, Senior Executive Service.

MEMBERS OF THE COMMITTEE

Chairman

Mr Axel E. FISCHER, MdB (DE) (Fed)

Vice-Chairmen

Mr Nigel EVANS, MP (UK) (Fed)

Mrs Rodoula ZISSI (GR) (Soc)

Titular Members

Mr Alejandro ALONSO NUNEZ (ES) (Soc)
Mrs Deborah BERGAMINI (IT) (Fed)
Dr Marton BRAUN (HU) (Fed)
Mr Alain COUSIN (FR) (Fed)
Mr Bill ETHERINGTON, MP (UK) (Soc)
Mr Giuseppe GALATI (IT) (Fed)
Mr Stanislaw GOGACZ (PL) (Fed)
Mr Pavel HOJDA (CZ)
Mr Reijo KALLIO (FI)
Mrs Birgen KELES (TR) (Soc)
Ms Gerd Janne KRISTOFFERSEN (NO) (Soc)
Mr Geert LAMBERT (BE) (Soc)
Mr Eduard LINTNER, MdB (DE) (Fed)
Mr Radu Catalin MARDARE (RO)
Mrs Manuela de MELO (PT) (Soc)
Mr Philippe MONFILS (BE) (Lib)
Mr Germinal PEIRO (FR) (Soc)
Mrs Adoración QUESADA BRAVO (ES) (Soc)
Mrs Beata SANIOVA (SK)
Mr Imre SOOÄÄR (EE) (Lib)
Mr Mehmet TEKELIOGLU (TR) (Fed)
Mr Noel TREACY (IE)
Mr George VOULGARAKIS (GR) (Fed)
Mr Arturas ZUOKAS (LT)

Mr Borislav Ivanov BALGARINOV (BG)
Mr Kurt BODEWIG, MdB (DE) (Soc)
Mr Erol Aslan CEBECI (TR) (Fed)
Mr Imre CZINEGE (HU) (Soc)
Mrs Blanca FERNÁNDEZ-CAPEL (ES) (Fed)
Mr Paolo GIARETTA (IT) (Lib)
Mr Norbert HAUPERT (LU) (Fed)
Mr Joachim HÖRSTER, MdB (DE) (Fed)
Mr Jan KASAL (CZ) (Fed)
Mr Jozef KLIM (PL) (Fed)
Mr Jean-Pierre KUCHEIDA (FR) (Soc)
Mr Jean-François LE GRAND (FR) (Fed)
Mr Jovan MANASIJEVSKI (MK) (Lib)
Mr Alan MEALE, MP (UK) (Soc)
Mr José MENDES BOTA (PT) (Fed)
Mrs Tuija NURMI (FI) (Fed)
Mr Rudolf PETAN (SI) (Fed)
Mr Giacinto RUSSO (IT) (Lib)
Mrs Joanna SENYSZYN (PL) (Soc)
Mr Janis STRAZDINS (LV)
Mr Angel TILVAR (RO) (Soc)
Dr Rudolf VIS, MP (UK) (Soc)
Mr Harm-Evert WAALKENS (NL) (Soc)

Alternate Members

Mr Adam ABRAMOWICZ (PL) (Fed)
Mr Ruhi AÇIKGÖZ (TR) (Fed)
Mr Mario BARBI (IT) (Lib)
Mrs Maria de BELÉM ROSEIRA (PT) (Soc)
Mrs Patrizia BUGNANO (IT) (Lib)
Mr Hubert DEITTERT, MdB (DE) (Fed)
Mr André FLAHAUT (BE) (Soc)
Mrs Gisèle GAUTIER (FR) (Fed)
Mrs Claude GREFF (FR) (Fed)
Mr Jean HUSS (LU) (Soc)
Mrs Florina Ruxandra JIPA (RO) (Soc)
Mr Jozef KOCHAN (CZ) (Fed)
Mr Jaakko LAAKSO (FI) (Soc)
Mr Jorge MACHADO (PT)
Mr Pasquale NESSA (IT) (Fed)
Mr Brian O'SHEA (IE) (Lib)
Mr Aristotelis PAVLIDIS (GR) (Fed)
Mr Yves POZZO DI BORGO (FR) (Fed)
Mr Paul ROWEN, MP (UK) (Lib)
Mr Adrian SOLOMON (RO)
Mr Mustafa UNAL (TR) (Fed)
Mr Luc VAN DEN BRANDE (BE) (Fed)

Mrs Fatima ABURTO BASELGA (ES) (Soc)
Mr Miguel ARIAS CAÑETE (ES) (Fed)
Mrs Doris BARNETT, MdB (DE) (Soc)
Mr Tim BOSWELL, MP (UK) (Fed)
Mrs Claire CURTIS-THOMAS, MP (UK) (Soc)
Mrs Josette DURRIEU (FR) (Soc)
Mr Herbert FRANKENHAUSER, MdB (DE) (Fed)
Mr Kestutis GLAVECKAS (LT)
Mr Bernd HEYNEMANN, MdB (DE) (Fed)
Mrs Sadije ILJAZI (MK)
Mr Haluk KOC (TR) (Soc)
Mr Tiny KOX (NL) (Soc)
Mr Markku LAUKKANEN (FI) (Lib)
Mr Krzysztof MATYJASZCZYK (PL)
Mr Edward O'HARA, MP (UK) (Soc)
Mr Milos PATERA (CZ) (Fed)
Mr Pavol PAVLIS (SK) (Soc)
Mr Gabino PUCHE RODRÍGUEZ (ES) (Fed)
Mr Witold SITARZ (PL) (Fed)
Mr Dimitris STAMATIS (GR)
Mr Giuseppe VALENTINO (IT) (Fed)

Secretary

Mr José-Manuel PEDREGOSA (ES)

Assistant

Mrs Carmela ROBERT (FR)